[DOCUMENT NAME] SPECIFICATION

[TITLE OF THE INVENTION] PROJECTION DISPLAY APPARATUS

[SCOPE OF CLAIM FOR PATENT]

[Claim 1] A projection display apparatus, comprising:

a communication control section that controls communication with an external device via either one of a first communication port and a second communication port;

a storage section; and

a control section that, in response to an initialization signal given via the first communication port, stores ID information corresponding to the initialization signal into the storage section, updates the initialization signal according to a predetermined rule, and transmits the updated initialization signal via the second communication port, the control section, in response to a command given via the first communication port, determining whether or not the command is directed to the projection display apparatus of interest, based on address information included in the command and the ID information stored in the storage section, the control section carrying out a series of processing specified by the command if the command is directed to the projection display apparatus of interest.

[Claim 2] A projection display apparatus in accordance with claim 1, wherein the control section transmits return information, which represents a result of the series of processing specified by the given command, via the first communication port after the series of processing has been completed, and if the control section receives return information given via the second port, the control section transmits via the first communication port the return information given via the second communication port.

[Claim 3] A projection display apparatus in accordance with either one of claims 1 and 2, further comprising a command input section other than the first and second communication ports, wherein the control section carries out

a series of processing specified by a command given via the command input section only when an initialization signal having prescribed contents is given via the first communication port, the control section neglecting the command given via the command input section when the given initialization signal has no prescribed contents.

[Claim 4] A projection display apparatus in accordance with claim 3, wherein when the initialization signal having the prescribed contents is given via the first communication port and a predetermined command is given via the command input section, the control section carries out a series of control to display an onscreen display menu that allows input of commands addressed to an arbitrary one of a plurality of projection display apparatuses including the projection display apparatus of interest.

[Claim 5] A projection display apparatus in accordance with claim 3, wherein when the initialization signal having the prescribed contents is given via the first communication port, the control section transmits via the second communication port a piece of information that specifies either one of a type of image signal supplied externally and a method of signal processing to be applied for the supplied image signal, when the initialization signal having the prescribe contents is not given via the first communication port, the control section receiving via the first communication port the piece of information that specifies either one of the type of image signal supplied externally and the method of signal processing to be applied for the supplied image signal and controlling a series of signal processing applied for the supplied image signal according to the received piece of information.

[Claim 6] A projection display apparatus in accordance with claim 1, further comprising a plurality of image signal input ports that receive image signals, wherein the control section selects an image signal given from one of the plurality of image signal input ports and controls projection and display of an image expressed by the selected image signal in response to a

command given via the first communication port.

[Claim 7] A projection display apparatus in accordance with claim 1, wherein the control section comprises a delay control section that delays an execution timing of a series of processing specified by a command given via the first communication port according to the ID information stored in the storage section.

[DETAILED DESCIPTION OF THE INVENTION]

[0001]

[Field of the Invention]

The present invention relates to a projection display apparatus that projects an image on a screen.

[0002]

[Description of the Prior Art]

Projection display apparatuses have widely been used, for example, for presentation in spacious rooms. Improvement has been made in lamps for image projection and liquid-crystal panels included in such projection display apparatuses (hereinafter simply referred to as projectors). A diversity of projectors have accordingly been developed to display images of high luminance and high picture quality without any noticeable flickering.

[0003]

[Problem to be solved by the Invention]

In the case where a picture image is projected on a screen in a spacious event hall, the use of only one projector does not give the projected image the sufficient brightness and results in unclearness of the projected image.

[0004]

One method of solving this problem provides a plurality of projectors and projects an identical picture image on an identical screen with the plurality of projectors.

[0005]

This method, however, disadvantageously requires labor- and time-consuming adjustments including adjustment of contrast in each of the plurality of projectors.

[0006]

The object of the present invention is thus to provide a projection display apparatus that is adjustable by simple operations in the case where an identical picture image is projected on an identical screen by a plurality of the projection display apparatuses.

[0007]

[Means for Solving the Problem and its Function/Effect]

The present invention is directed to a projection display apparatus, which includes: a communication control section that controls communication with an external device via either one of a first communication port and a second communication port; a storage section; and a control section that, in response to an initialization signal given via the first communication port, stores ID information corresponding to the initialization signal into the storage section, updates the initialization signal according to a predetermined rule, and transmits the updated initialization signal via the second communication port. In response to a command given via the first communication port, the control section determines whether or not an address of the command is for the projection display apparatus of interest, based on address information included in the command and the ID information stored in the storage section. If the address of the command is for the projection display apparatus of interest, the control section carries out a series of processing specified by the command.

[0008]

A plurality of the projection display apparatuses having the above configuration are connected in series, such that a first communication port of a second projection display apparatus is connected with a second

communication port of a first projection display apparatus and a first communication port of a third projection display apparatus is connected with a second communication port of the second projection display apparatus. When the initialization signal is given into the first projection display apparatus, this arrangement of the present invention enables the ID information to be stored in the storage section of each projection display apparatus. In this state, when a command including address information to specify a desired projection display apparatus is given to the first projection display apparatus, the command goes to the desired projection display apparatus specified by the address information included in the command. The control section of the desired projection display apparatus then carries out the series of processing specified by the command.

[0009]

In accordance with one preferable application of the present invention, the control section transmits return information, which represents a result of the series of processing specified by the given command, via the first communication port after the series of processing has been completed. If the control section receives return information given via the second port, the control section transmits via the first communication port the return information given via the second communication port.

[0010]

In this application, the result of the series of processing specified by the command is returned to the transmission source of the command. This arrangement facilitates the management of the respective projection display apparatuses at the transmission source.

[0011]

In one preferred embodiment, the projection display apparatus further includes a command input section other than the first and second communication ports. In this structure, the control section carries out a series of

processing specified by a command given via the command input section only when an initialization signal having prescribed contents is given via the first communication port. The control section neglects the command given via the command input section, on the other hand, when the given initialization signal has no prescribed contents.

[0012]

This arrangement restricts the address of the command input to the specified projection display apparatus and effectively prevents any non-selected projection display apparatus from unintentionally receiving the command.

[0013]

In one preferable application of this embodiment, when the initialization signal having the prescribed contents is given via the first communication port and a predetermined command is given via the command input section, the control section carries out a series of control to display an onscreen display menu that allows input of commands addressed to an arbitrary one of a plurality of projection display apparatuses including the projection display apparatus of interest.

[0014]

This arrangement facilitates the command input into any of the plurality of projection display apparatuses.

[0015]

In another preferable application of this embodiment, when the initialization signal having the prescribed contents is given via the first communication port, the control section transmits via the second communication port a piece of information that specifies either one of a type of image signal supplied externally and a method of signal processing to be applied for the supplied image signal. When the initialization signal having the prescribed contents is not given via the first communication port, on the

other hand, the control section receives via the first communication port the piece of information that specifies either one of the type of image signal supplied externally and the method of signal processing to be applied for the supplied image signal, and controls a series of signal processing applied for the supplied image signal according to the received piece of information.

[0016]

This arrangement enables the identical method of signal processing to be applied for processing the image signal in the respective projection display apparatuses.

[0017]

In accordance with another preferable application of the present invention, the projection display apparatus further includes a plurality of image signal input ports that receive image signals. In this structure, the control section selects an image signal given from one of the plurality of image signal input ports and controls projection and display of an image expressed by the selected image signal in response to a command given via the first communication port.

[0018]

This arrangement arbitrarily selects one among a plurality of image sources and enables a desired image to be projected with a plurality of the projection display apparatuses.

[0019]

In accordance with still another preferable application of the present invention, the control section has a delay control section that delays an execution timing of a series of processing specified by a command given via the first communication port according to the ID information stored in the storage section.

[0020]

This arrangement equalizes the execution timing of the series of

processing specified by the command in the respective projection display apparatuses.

[0021]

[Description of the Preferred Embodiment]

One mode of carrying out the present invention is described below as a preferred embodiment with referring to the drawings.

[0022]

A. Structure of Embodiment:

Fig. 1 is a block diagram illustrating the structure of a projector in one embodiment of the present invention. In the illustrated structure, an image signal interface 1 receives image signals supplied from an external image source (not shown) via an image signal input port DI and gives the received image signals to an image processing unit 2. The image signal interface 1 also causes the image signals given into the image signal input port DI to be directly output from an image signal output port DO.

[0023]

The image processing unit 2 carries out various series of signal processing for the image signals supplied via the image signal interface 1, generates image data representing an image of interest, which is an object of projection, and stores the generated image data into a frame memory (not shown).

[0024]

An image projection unit 3 projects an image corresponding to the image data stored in the frame memory of the image processing unit 2 onto a non-illustrated screen and includes, for example, illumination lamps and liquid-crystal panels.

[0025]

A communication control unit 4 controls serial communications via two serial communication ports P1 and P2.

[0026]

A control panel interface 5 detects operation events of various switches disposed on a control panel of the projector and controls lighting of indicators, such as LEDs, disposed on the control panel.

[0027]

A remote control interface 6 receives an infrared signal transmitted from a non-illustrated remote control and demodulates a command from the given infrared signal.

[0028]

A memory 7 is a non-volatile memory constructed by a static RAM or an EEPROM having backup power supply, and functions to store a diversity of control programs and various pieces of control information.

[0029]

A control unit 7 is the control center of this projector and controls the respective constituents of the projector according to the diversity of control programs stored in the memory 7.

[0030]

A stack control task is one of the control tasks executed by the control unit 7. The stack control task is characteristic of this embodiment and is provided specifically for working conditions that a plurality of projectors including this projector project an identical image. The details of the stack control task will be discussed later.

[0031]

The user may provide a plurality of the projectors having the arrangement of this embodiment and project an identical image with the plurality of the projectors.

[0032]

When the identical image is projected with the plurality of projectors, it is required to connect an image source with the respective projectors.

Figs. 2 and 3 show examples of such connection.

[0033]

The illustrated example of Fig. 2 includes projectors 11 through 14 having the arrangement of this embodiment, a screen 20, and an image source 30, which may be a personal computer or a video player to supply image signals to the respective projectors.

[0034]

In the example of Fig. 2, the image source 30 and the respective projectors 11 through 14 are connected in series via communication cables. In the state of serial connection, an image signal output from the image source 30 is supplied to the image signal input port DI of the projector 11. The image signal is taken into the image processing unit 2 via the image signal interface 1 included in the projector 11, and an image corresponding to the image signal is projected onto the screen 20 by means of the image projection unit 3. The image signal interface 1 also causes the image signal given into the image signal input port DI to be output directly from the image signal output port DO. The output image signal is then supplied to the image signal input port DI of the next projector 12. Similar operations proceed in the respective projectors 12, 13, and 14. The image signal output from the image source 30 is thus supplied to the respective projectors serially in the sequence of 11→12→13→14. An identical image is then projected with these projectors.

[0035]

In the illustrated example of Fig. 3, the respective projectors 11 through 14 are connected in parallel with the image source 30 via a distributor 31. In this example, the distributor 30 distributes an image signal output from the image source 30 into the respective image signal input ports DI of the projectors 11 through 14. Each projector projects an image onto the screen 20 in response to the image signal given to the own image signal input

port DI.

[0036]

In the case where a plurality of projectors are used for projection as in the illustrated examples of Figs. 2 and 3, in order to obtain a clear projected image, the respective projectors should project an identical image in an identical area on the screen 20. For this purpose, it is required to adjust the attitude, the direction of projection, the range of projection, and the shape of the projected image with regard to each projector. In some cases, in order to adjust the contrast of the image currently projected on the screen, it is also required to vary a specific control parameter in all the projectors or to vary a specific control parameter in a specific projector.

[0037]

In the prior art system, the user carries out the adjustments and the variations through operations of the corresponding switches on the control panel in the projector of interest. Such labor- and time-consuming operations are, however, rather inconvenient in the case where a plurality of projectors are used for projection.

[0038]

The arrangement of this embodiment enables a desired command to be given to all the projectors or to only a desired projector by simply carrying out required operations to input the command into a representative projector among the plurality of projectors. In order to actualize such arrangement, it is required to connect the respective projectors like an illustrated example of Fig. 4.

[0039]

In the example of Fig. 4, a serial communication port of a controller 40, for example, a personal computer, is connected to a serial communication port P1 of a projector 11 via a communication cable, and a serial communication port P2 of the projector 11 is connected to a serial communication port P1

of a projector 12 via a communication cable. In a similar manner, four projectors 11 through 14 are serially connected via the respective serial communication ports P1 and P2 in the example of Fig. 4.

[0040]

In this state of serial connection, the projector 11 functions as a representative of all the projectors to receive commands and manage the respective projectors. In the arrangement of this embodiment, such a projector is called the master projector.

[0041]

The other projectors 12 through 14 serially connected with the projector 11 or the master projector receive commands via the master projector and are, from this point of view, under the control of the master projector. In the arrangement of this embodiment, these projectors are called the slave projectors.

[0042]

In the state of connection shown in Fig. 4, the user gives a desired command to all the projectors 11 through 14 or any desired projector via the projector 11 (master projector) through operations of a remote control 50 or operations of switches on a control panel. In the case of connection with the controller 40 as shown in Fig. 4, the user transmits a command from the controller 40 to all the projectors 11 through 14 or any desired projector.

[0043]

The state that ensures the command transfer among a plurality of projectors is referred to as the stack state in this embodiment. In the example of Fig. 4, the projector 11 functions as the master projector, whereas the other projectors 12 through 14 function as the slave projectors. The command is transmitted to the respective projectors in the sequence of the projectors 12→13→14 via the projector 11. The structure of this command transmission system is referred to as the stack structure in this embodiment.

[0044]

The stack control task mentioned above sets each projector in this stack state and controls operations of the respective projectors in the stack state.

[0045]

B. Operations of Embodiment:

The following describes the operations of the embodiment, especially the operations relating to the stack control task.

[0046]

(1) Introduction Process and Stack State Control:

In order to send a command to a desired projector in the state of serial connection of the respective projectors as illustrated in Fig. 4, the required procedure specifies the stack structure in advance, teaches its identification (the master projector or the slave projector and the position in the latter case), and enables each projector to carry out the control according to its identification. The series of processing for this purpose is referred to as the introduction process in this embodiment. The processing carried out by the control unit 8 in each projector 8 in the introduction process is referred to as the stack state control.

[0047]

Fig. 5 is a flowchart showing a routine of this stack state control.

[0048]

In the introduction process, the controller 40 transmits a stack definition packet as an initialization signal. The stack definition packet includes number information, which represents the number of working projectors. In the initial stage on transmission from the controller 40, the number information is set equal to '0'.

[0049]

In the state of connection shown in Fig. 4, the projector 11 first receives this stack definition packet.

[0050]

In response to the input of the stack definition packet via the serial communication port P1, the control unit 8 in the projector 11 sends back an ACK signal to the controller 40 via the serial communication port P1 and starts the routine of Fig. 5.

[0051]

The control unit 8 first determines at step S1 whether or not the number information included in the stack definition packet is equal to '0'. Here the decision gives 'YES', and the program proceeds to step S2 where the control unit 8 recognizes the own projector (the projector 11) as the master projector and stores ID information representing the fact into the memory 7.

[0052]

At subsequent step S3, the control unit 8 increments the number information to '1' and outputs the updated stack definition packet, which includes the incremented number information, via the serial communication port P2.

[0053]

The control unit 8 then shifts to the operations as the master projector (step S4), and exits from this stack state control routine.

[0054]

The stack definition packet transmitted from the serial communication port P2 of the projector 11 is supplied to the serial communication port P1 of the subsequent projector 12. In response to the input of this stack definition packet, the control unit 8 in the projector 12 sends back the ACK signal to the projector 11 via the serial communication port P1 and starts the stack state control routine shown in Fig. 5.

[0055]

Here the number information included in the given stack definition packet is equal to '1'. The decision at step S1 accordingly gives 'NO', and the

program proceeds to step S11 where the control unit 8 recognizes the own projector (the projector 12) as the slave projector and stores the number information '1' as the slave ID of the own projector into the memory 7.

[0056]

At subsequent step S12, the control unit 8 increments the number information to '2' and outputs the updated stack definition packet, which includes the incremented number information, via the serial communication port P2.

[0057]

The control unit 8 then starts counting a preset time (step S13) and repeatedly determines whether or not the ACK signal is received via the serial communication port P2 until the preset time has elapsed (steps S14 and S15).

[0058]

In the case where the ACK signal is received before the time out, the control unit 8 recognizes the own projector (the projector 12) not as the final-stage slave projector but as an intermediate slave projector, writes the information regarding this fact into the memory 7, and shifts to the operations as the intermediate slave projector (step S16), before exiting from this stack state control routine.

[0059]

In the state of connection shown in Fig. 4, the serial communication port P2 of the projector 12 is connected with the serial communication port P1 of the projector 13. The serial communication port P2 of the projector 13 is connected with the serial communication port P1 of the projector 14. The projectors 12 and 13 accordingly receive the ACK signal except for any special circumstances, for example, the ceased communication functions of the subsequent projector. The processing of step S16 is thus executed in the case of the projectors 12 and 13.

[0060]

In the example of Fig. 4, the serial communication port P2 of the projector 14 has no connection. When the projector 14 receives the stack definition packet and its control unit 8 executes the stack state control routine, the ACK signal has not been received at step S14 before the time out. The program accordingly proceeds to step S17 where the control unit 8 regards the own projector as the final-stage slave projector, writes the information regarding this fact into the memory 7, and shifts to the operations as the final-stage slave projector. At step S17, the control unit 8 also transmits a return packet, which includes the slave ID (in this case, '3') of the own projector, via the serial communication port P1. The return packet is relayed by the projectors 13, 12, and 11, which are located before the projector 14, and returned to the controller 40. The controller 40 specifies the number of connecting projectors, based on the contents of the return packet. The controller 40 gives an error display when the return packet has not been received before elapse of a preset time since the transmission of the stack definition packet. There are some possible causes of such failure; for example, the master projector may not be normally connected to the controller 40.

[0061]

On conclusion of the processing of step S17, the control unit 8 of the projector 14 exits from the stack state control routine.

[0062]

(2) Command Process:

On completion of the series of introduction process discussed above, the master projector, as the representative of all the projectors, receives commands and transmits the commands to the slave projectors according to the requirements.

[0063]

The user can give commands to any desired projectors via the master

projector. The commands are given into the master projector, for example, through operations of the switches on the control panel of the master projector, through transmission of infrared signals from the remote control 50 to the master projector, and through operations of the controller 40.

[0064]

In the structure of the embodiment, in order to ensure the sufficient functions of the master projector, a display control program of an OSD menu, which is executed when the projector is identified as the master projector, is stored in the memory 7.

[0065]

In response to a preset command input from the remote control, the control unit 8 of the projector identified as the master projector gives an instruction to the image processing unit 2 to display an OSD (onscreen display) menu exclusively used for the stack state according to this display control program. The contents of the OSD menu are different from those displayed by the projector used in the stand alone state, and enable the user to input a command, which is addressed to a desired projector among all the projectors in the stack state. For example, in the case where a command input through operations of the remote control requires adjustment of the volume in a projector, the master projector displays the projected OSD menu for the stack state, which includes a bar graph representing the current volume of each projector. The user checks the bar graph, and specifies a desired projector and sends a command to regulate the volume to the master projector through operations of the remote control.

[0066]

In the projector identified as the slave projector, the control unit 8 masks the output signals of the control panel interface 5 and the remote control interface 6 and does not carry out any processing in response to the operations of the switches on the control panel or the infrared signals

transmitted from the remote control. Only the master projector is accordingly effective in the stack state for the command input through the operations of the control panel or the operations of the remote control.

[0067]

Here the commands include broadcast commands addressed to all the projectors in the stack state and commands addressed to specific projectors. Each command addressed to a specific projector includes address information showing that the address of the command is either the master projector or the slave projector. In the latter case, the address information further includes the slave ID of the slave projector, to which the command is addressed.

[0068]

Any command is first input into the master projector and eventually reaches the addressed projector via one or a plurality of slave projectors according to the requirement.

[0069]

Fig. 6 is a flowchart showing the details of a command process routine executed by the projector that receives a command via the serial communication port P1.

[0070]

The control unit 8, which has just received the command, first determines whether or not the input command is a broadcast command (step S21). When the decision gives 'NO', the program proceeds to step S22 where the control unit 8 determines whether or not the address of the received command is the own projector. In the case where the address is a specific slave projector and the own projector is a slave projector, the control unit 8 refers to the slave ID stored in the memory 7 and carries out the decision at step S21. When the decision at step S21 gives 'NO', the program proceeds to step S23 where the control unit 8 transmits the received command via the serial communication

port P2, and exits from the command process routine.

[0071]

The series of the processing discussed above causes the command given into the master projector to reach the addressed projector via one or a plurality of projectors.

[0072]

In the case where the address of the received command is the own projector, the decision at step S22 gives 'YES'. The program then proceeds to step S24 where the control unit 8 carries out a series of processing specified by the received command, for example, adjustment of control parameters in the image processing unit 2 and the image projection unit 3.

[0073]

The program subsequently proceeds to step S25 where the control unit 8 outputs a return packet, which includes results of the processing specified by the received command, via the serial communication port P1. The return packet is relayed to the master projector and further sent to the controller 40. The master projector and the controller 40 check whether or not the series of processing specified by the command has been carried out normally, based on the contents of the return packet. On completion of the process of step S25, the control unit 8 exits from the command process routine.

[0074]

In the case where the received command is a broadcast command, the decision at step S21 gives 'YES'. In this case, the program proceeds to step S26 where the control unit 8 transmits the received command via the serial communication port P2. After the transmission, the control unit 8 carries out the series of processing specified by the received command (step S24).

[0075]

In the course of carrying out the series of processing specified by the broadcast command at step S24, the control unit 8 refers to the ID information

(either the information representing the identification as the master projector or the slave ID) and carries out delay control to delay the execution timing of the series of processing specified by the command. If each projector immediately starts the series of processing in response to the received broadcast command, the end timing of the processing specified by the broadcast command is varied among the respective projectors. This may cause abnormality of the resulting projected image. The procedure thus adjusts the start timing of the processing, in order to ensure the identical end timing of the processing among the respective projectors.

[0076]

On completion of the processing specified by the command, the control unit 8 transmits the return packet (step S25) and exits from the command control routine.

[0077]

The command process is carried out in the above manner in this embodiment.

[0078]

In the arrangement of the embodiment, the series of command process discussed above is carried out in the respective projectors connected in series. This arrangement enables the user to send any desired command to all the projectors or any desired specific projector and carry out any required operations, for example, on/off operations of lamps and adjustments of contrast, brightness and color of the image, with regard to all the projectors or any specific projector. For this purpose, the user simply inputs the command, which is addressed to all the projectors or any desired projector, into the master projector through operations of the remote control or the controller 40. This arrangement advantageously saves the labor and time of the command input.

[0079]

(3) Processing of Image Signals:

The control unit 8 included in the projector, which is identified as the master projector in the stack state, specifies the type of the image signals given from the image signal input port DI (for example, SVGA) and requests the image processing unit 2 to carry out a process of signal conversion that converts the image signals into another signal representation suitable for display.

[0080]

The control unit 8 in the master projector also transmits the information, which has been given via the image signal input port DI and represents the type of the image signal or the process of signal conversion, from the serial communication port P2 to the slave projector.

[0081]

The control unit 8 in the slave projector receives this information via the serial communication port P1, specifies the process of signal conversion carried out in the master projector based on the input information, and requests the image processing unit 2 to carry out the same process of signal conversion.

[0082]

In this manner, the technique of the embodiment enables all the projectors in the stack state to carry out the identical process of signal conversion with regard to the image signals.

[0083]

(4) Switchover Process of Image Source:

The projector shown in Fig. 1 has only one image signal input port. In one possible modification, one projector has a plurality of image signal input ports, and the control unit 8 executes the additional control function to select image signals input via a desired image signal input port and supply the selected image signals to the image processing unit 2. This modified arrangement enables switchover of the image source.

[0084]

A plurality of the projectors having such modified structure are connected in series as illustrated in Fig. 4, and image signals are supplied from a plurality of image sources to the individual projectors. In this structure, the user gives a broadcast command for selecting a desired image signal input port to the master projector. This arrangement enables the image from a desired image source to be projected by all the projectors.

[0085]

(5) Operations for Restarting:

When the power source of each projector is once turned off and then again turned on after completion of the series of introduction process discussed above, a series of restarting process is carried out in each projector.

[0086]

In the restarting process, in the same manner as the introduction process discussed above, the stack definition packet is transmitted from the controller 40 and transferred to the respective projectors in the sequence of the projectors 11→12→13→14 in the state of connection shown in Fig. 4. The stack state control process shown in Fig. 5 is then executed again in each projector. At this moment, each projector compares the newly received number information with the ID information stored in the memory 7 (either the information representing the identification as the master projector or the slave ID) and determines whether or not there is any conflict. For example, in the case where the currently received number information is equal to '2' while the slave ID stored in the memory 7 is equal to '1', the projector transmits the return packet representing the conflict via the serial communication port P1. The return packet is given back to the master projector and the controller 40 for error display. Such conflict occurs when there is any change in connection of the respective projectors between the introduction process and the current restarting process. The user

accordingly checks the state of connection and rearranges the connection if required.

[0087]

C. Modifications:

The embodiment discussed above transmits commands and responses through serial communications between the controller and the individual projectors. One possible modification carries out the transmission through parallel communications between the controller and the individual projectors.

[0088]

[Effect of the Invention]

As described above, the arrangement of the present invention effectively facilitates the adjustment of each projection display apparatus when an identical image is projected with a plurality of projection display apparatuses.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[Fig. 1]

a block diagram illustrating the structure of a projector in one embodiment of the present invention;

[Fig. 2]

a diagram illustrating the structure of one projection system including a plurality of the projectors;

[Fig. 3]

a diagram illustrating the structure of another projection system including a plurality of the projectors;

[Fig. 4]

a diagram showing the structure of a transmission system of control commands in the projection system;

[Fig. 5]

a flowchart showing a processing routine executed by the control unit

8 of the embodiment; and

[Fig. 6]

a flowchart showing another processing routine executed by the control unit 8 of the embodiment.

[Description of the Symbols]

1 ··· image signal interface

2 ··· image processing unit

3 ··· image projection unit

4 ··· communication control unit

5 ··· control panel interface

6 ··· remote control interface

7 ··· memory

8 ··· control unit

20 ··· screen

30 ··· image source

31 ··· distributor

11-14 ··· projector

40 ··· controller

50 ··· remote control